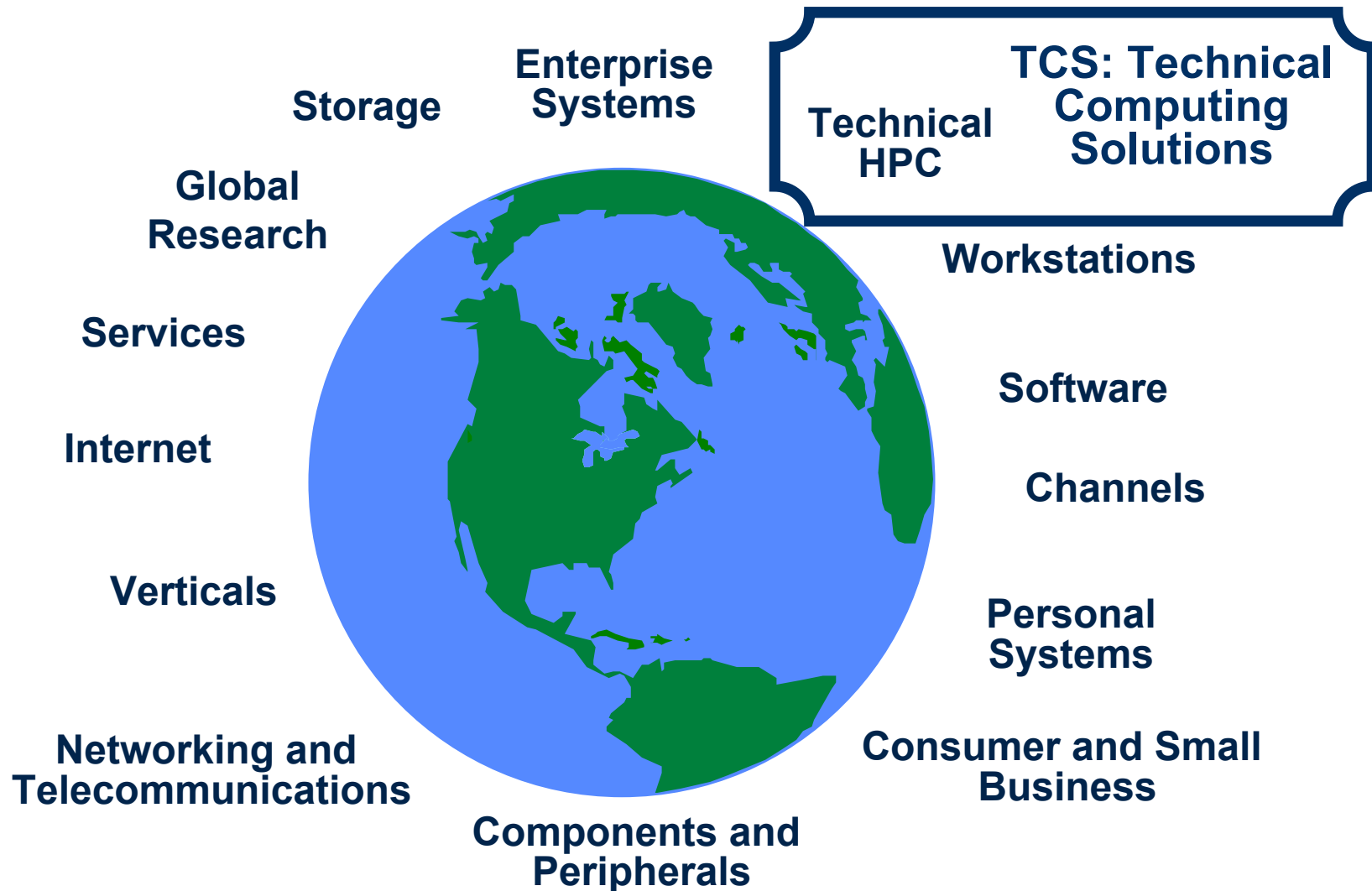


HPC Market Growth and Customer Pain Points

Fernando Maldonado
Analista de IDC

IDC Research Areas



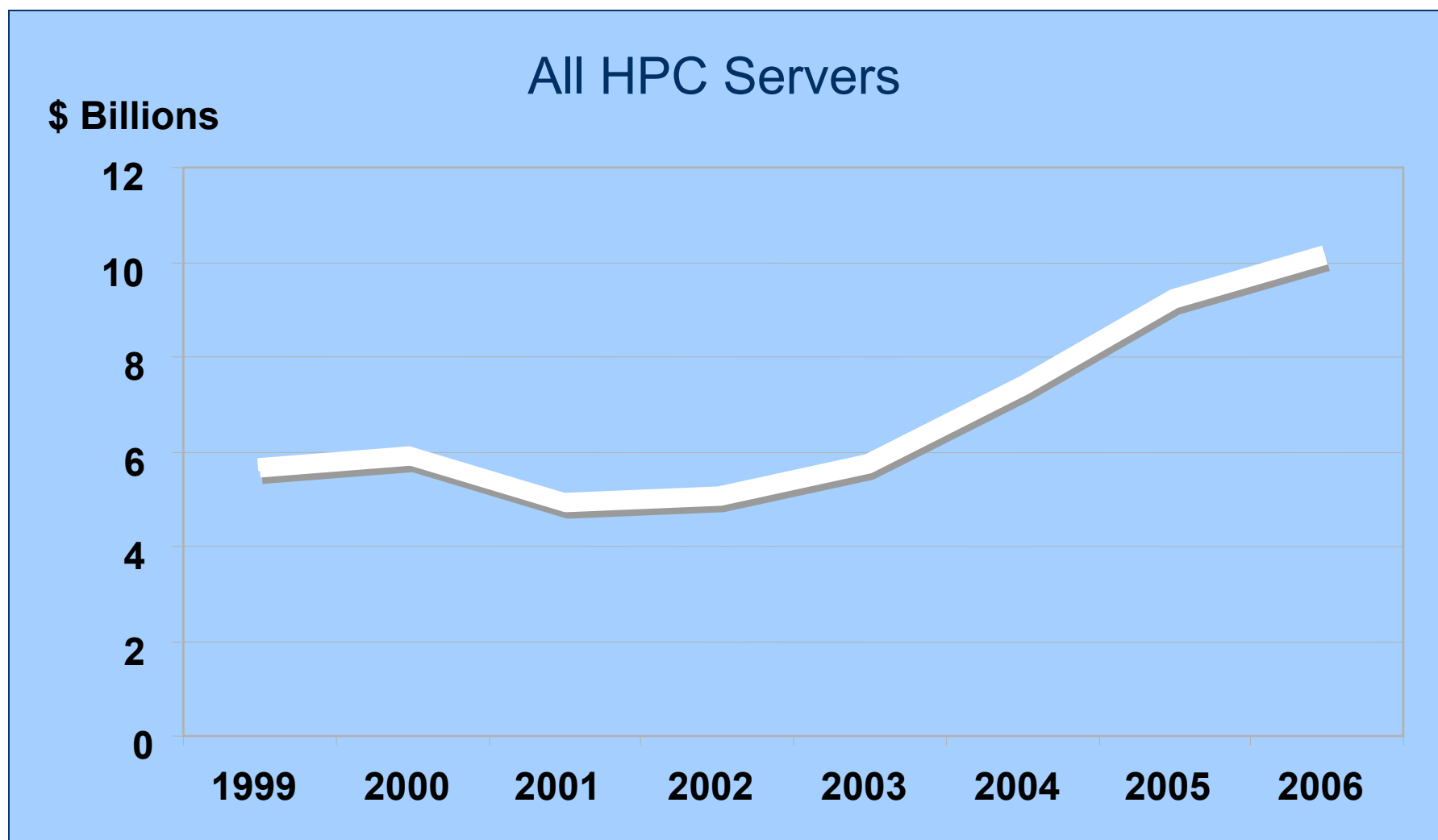
What Is HPC?

HPC covers all computers that are used for highly computational or data-intensive tasks

IDC now uses these terms to cover all technical servers used by scientists, engineers, financial analysts, and others

It excludes commercial servers used for business and transaction processing (these are ~80% of all servers)

Strong Growth Since 2002



All Worldwide Servers Compared To HPC

Worldwide Value For All Servers

Server Class	2003	2004	2005	2006	CAGR
Volume server	\$19,870	\$23,526	\$26,300	\$27,454	11.4%
Midrange enterprise server	\$13,816	\$13,169	\$13,161	\$12,639	-2.9%
High-End enterprise server	\$12,464	\$12,446	\$11,823	\$12,193	-0.7%
Total	\$46,149	\$49,141	\$51,283	\$52,285	4.2%
HPC	\$5,698	\$7,393	\$9,208	\$10,078	20.9%
	12.3%	15.0%	18.0%	19.3%	

HPC Over the Last Five Years & Forecasts IDC

Analyze the Future

	2000	2005	2010
North America	\$2,375,925	\$4,570,954	\$6,649,414
Europe	\$2,084,099	\$2,883,810	\$4,537,396
Asia/Pacific	\$442,316	\$1,069,379	\$1,919,892
Japan	\$830,947	\$638,905	\$986,623
ROW	\$162,647	\$34,973	\$171,840
Total	\$5,895,934	\$9,198,020	\$14,265,164

Source: IDC May 2006

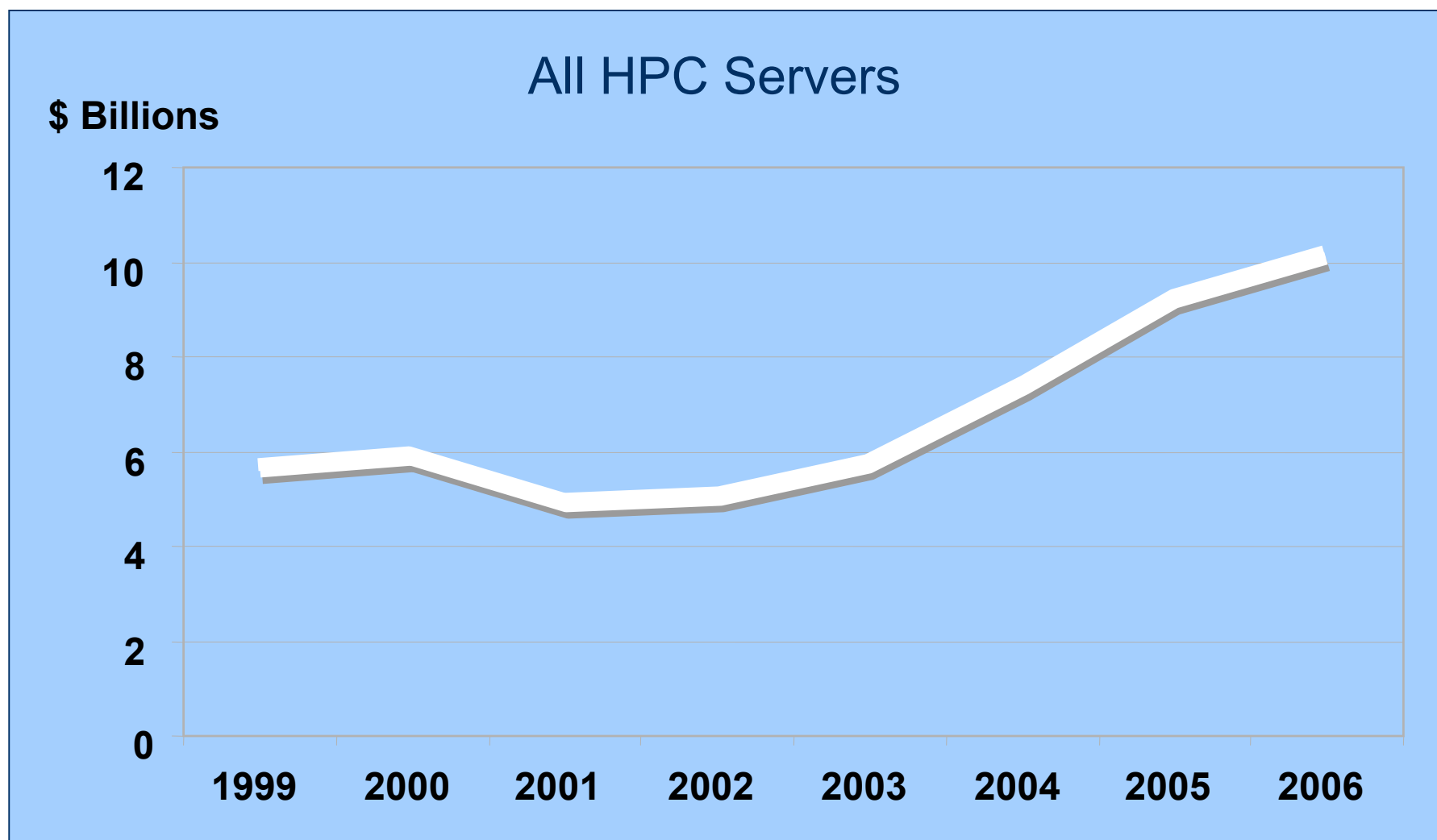
HPC Over the Last Five Years & Forecasts



	2000	2005	2010
Bio-Sciences	\$585,358	\$1,433,807	\$2,218,965
CAE	\$839,669	\$1,108,510	\$1,978,185
Chemical Engineering	\$324,601	\$222,466	\$447,418
DCC & Distribution	\$113,464	\$513,684	\$627,877
Economics/Financial	\$203,067	\$254,967	\$483,848
EDA	\$457,630	\$648,477	\$1,036,687
Geosciences and Geo-eng	\$181,863	\$489,452	\$800,670
Mechanical Design and Dr	\$114,185	\$155,843	\$198,902
Defense	\$760,065	\$811,335	\$1,651,183
Government Lab	\$688,555	\$1,375,964	\$1,671,932
Software Engineering	\$93,634	\$19,774	\$18,531
Technical Management	\$275,562	\$101,561	\$73,023
University/Academic	\$933,386	\$1,699,966	\$2,498,767
Weather	\$171,127	\$358,978	\$494,431
Other	\$153,769	\$3,238	\$64,744
Total Revenue	\$5,895,934	\$9,198,020	\$14,265,164

Source: IDC May 2006

Strong Growth Since 2002



IDC's HPC Market Definitions

Technical Capability

- Systems configured and purchased to solve the largest most demanding problems

Technical Enterprise

- Systems purchased to support technical applications in throughput environments selling for \$1 million or more

Technical Divisional

- Systems purchased for throughput environments selling from \$250,000 to \$999,000

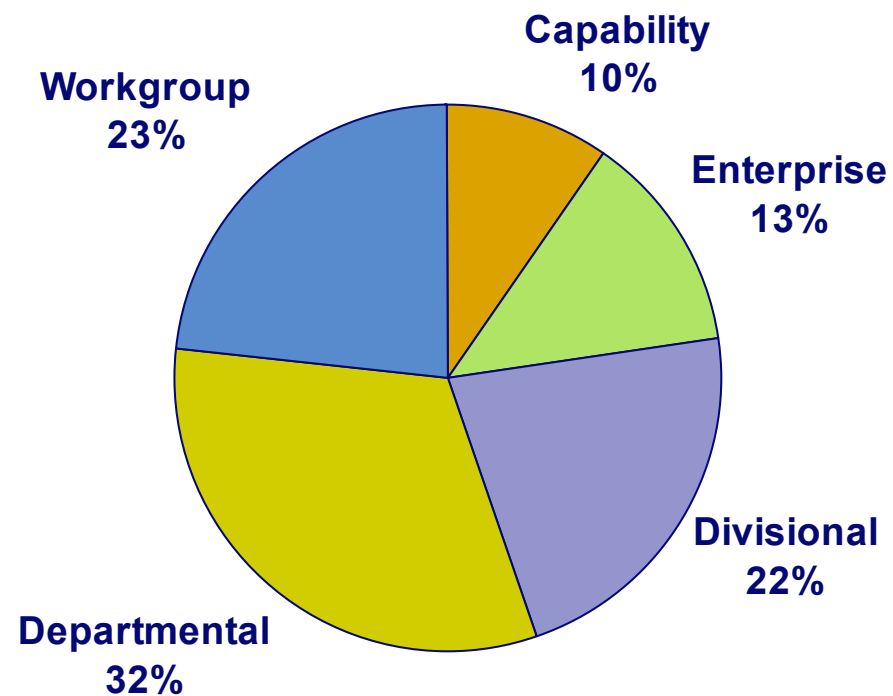
Technical Departmental

- Systems purchased for throughput environments selling for \$50,000 to \$250,000

Technical Workgroup

- Has been added for systems under \$50,000

HPC Revenue by Competitive Segment.2005



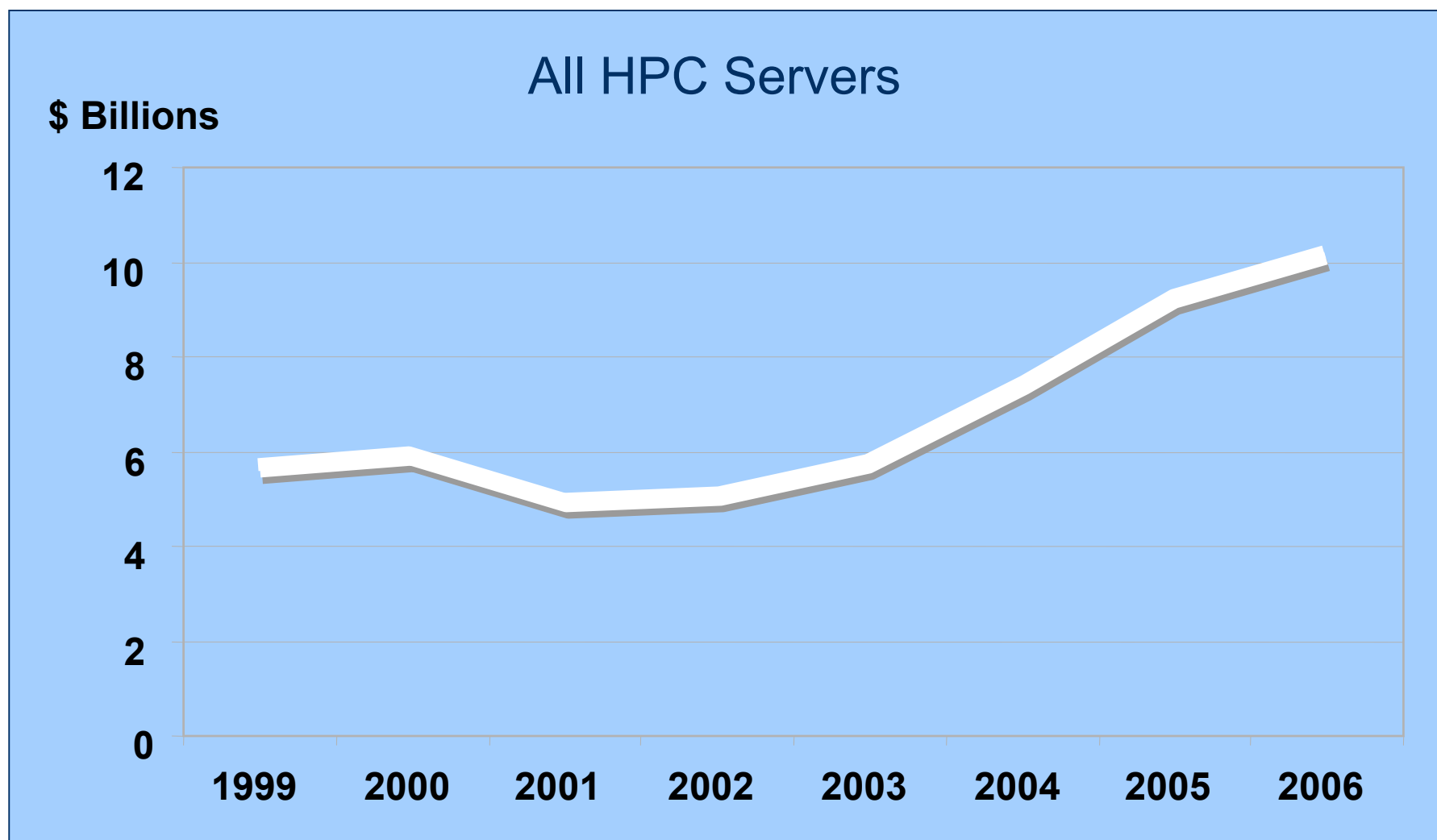
Source: IDC 2006

HPC Over the Last Five Years & Forecasts

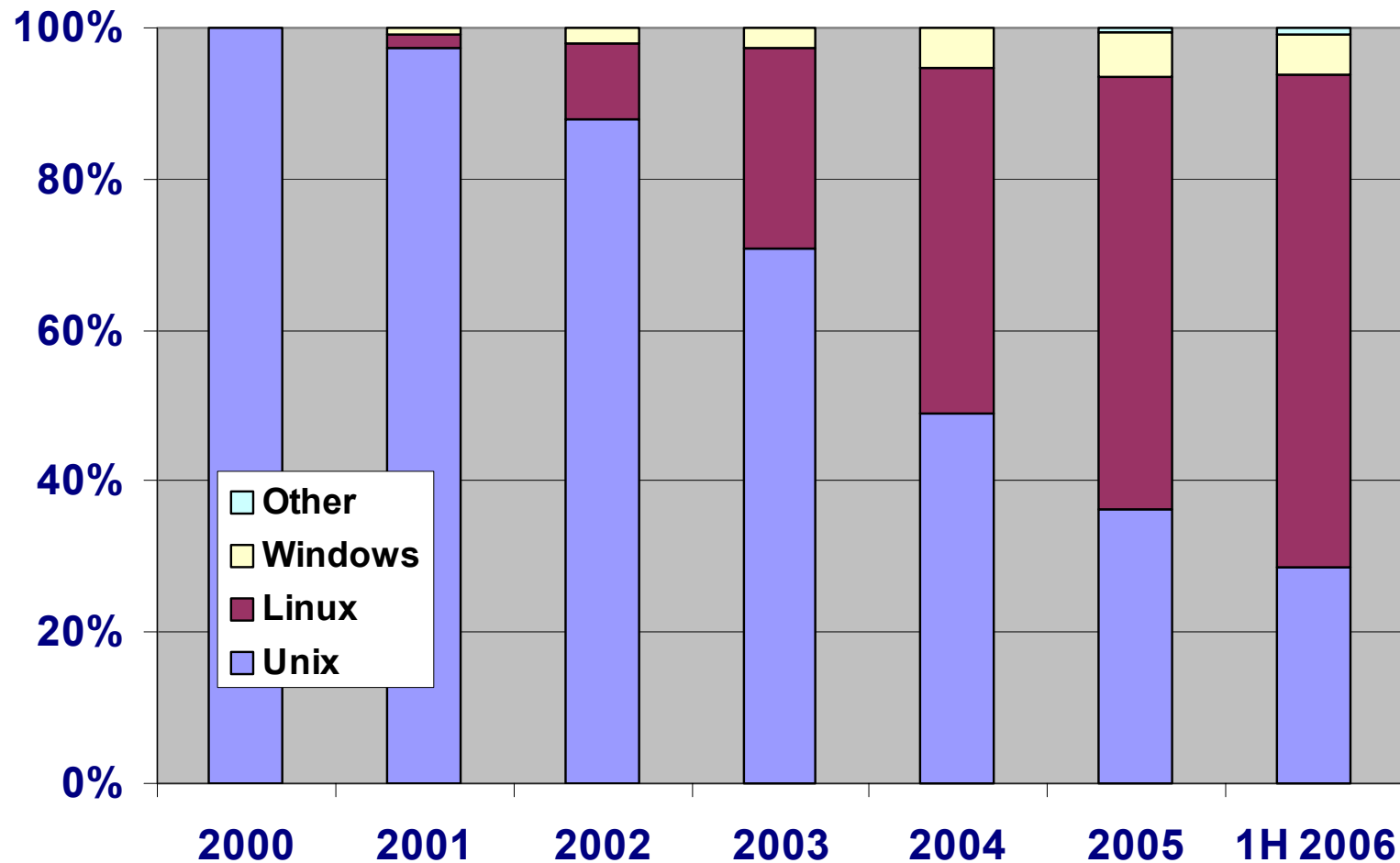
	2000	2005	2010
Capability	\$ 849,250	\$ 916,398	\$ 990,957
Enterprise	\$ 763,323	\$ 1,230,993	\$ 1,560,935
Divisional	\$ 1,897,006	\$ 1,950,647	\$ 3,404,690
Departmental	\$ 1,267,738	\$ 2,947,633	\$ 4,901,073
Workgroup	\$ 1,118,617	\$ 2,152,351	\$ 3,407,510
Total	\$ 5,895,934	\$ 9,198,020	\$ 14,265,164

Source: IDC May 2006

Strong Growth Since 2002

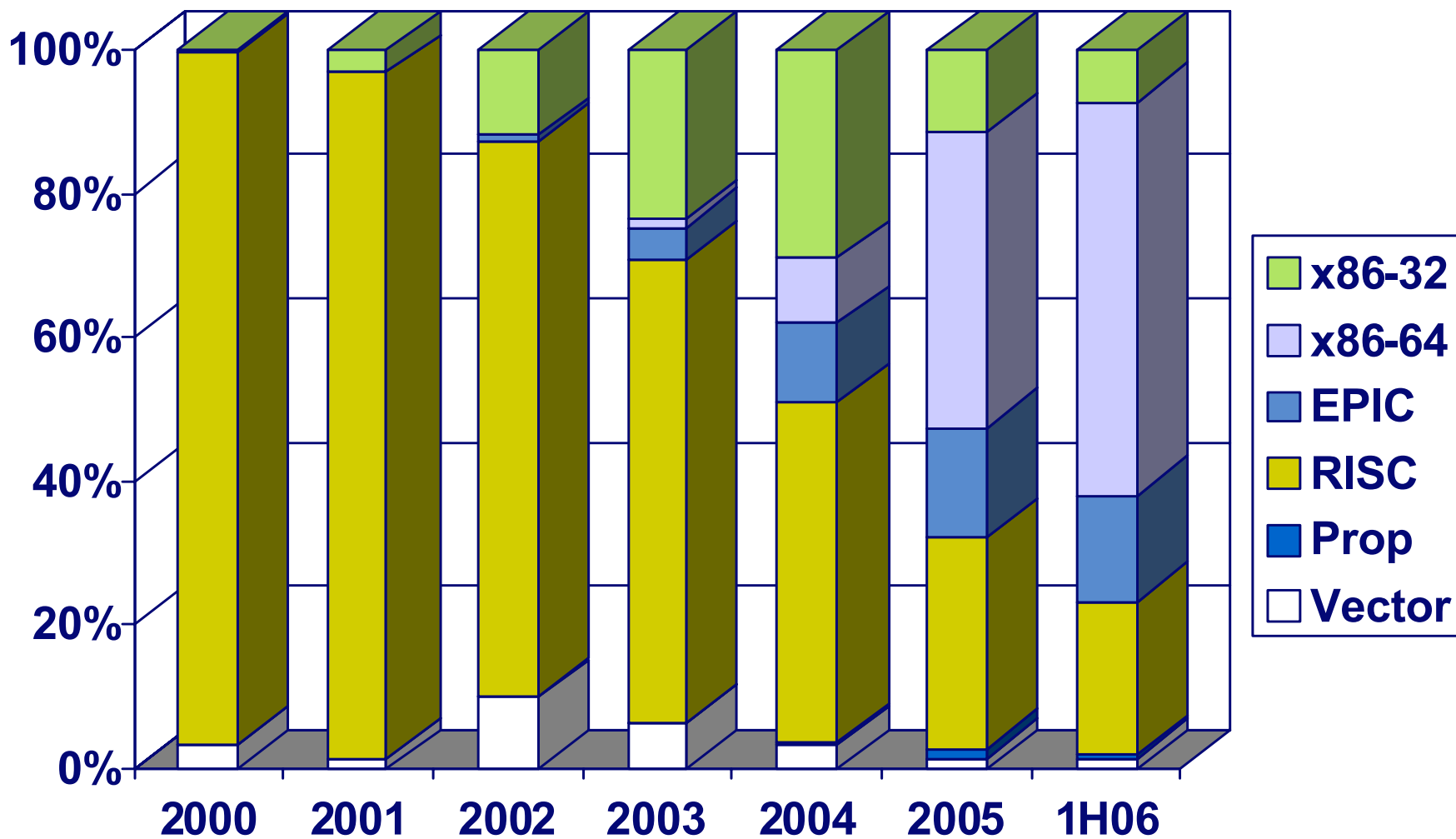


HPC Revenue Share by OS Installed



Linux: 65% in 1H 2006

HPC Revenue Share by Processor Type



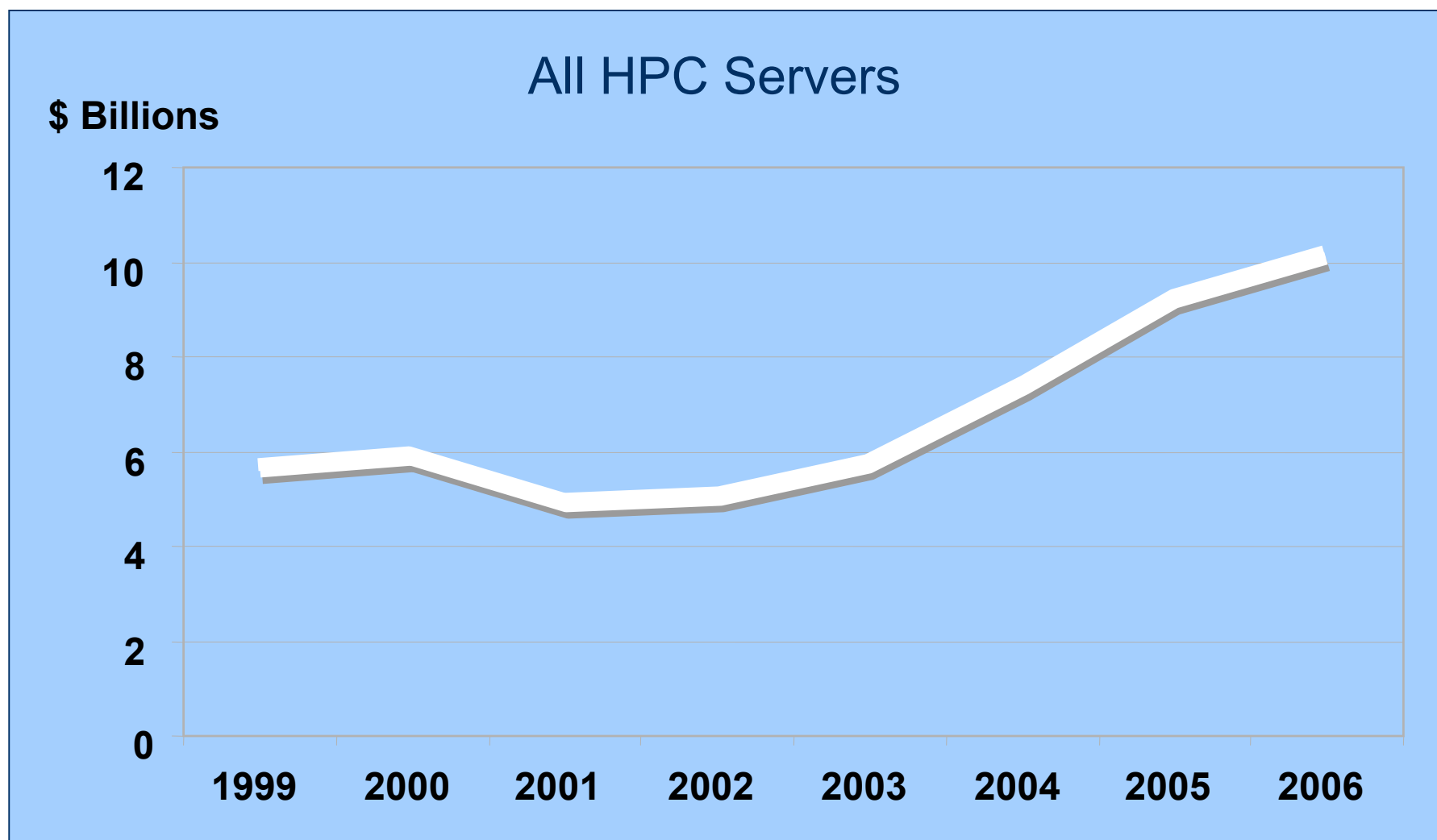
Prop = Proprietary (e.g., FPGA, BlueGene, Cell)

Why? ... Price

HPC All Servers Processor Summary, 2006

	Ave. CPUs / System	System ASP (\$K)	System \$(K) / CPU	CPU/\$M
X86	15.9	35.9	2,255	443
EPIC	6.7	56.1	8,373	119
RISC	10.1	59.0	5,840	171
Vector	13.5	1,233	91,436	11

Strong Growth Since 2002



IDC's Cluster Market Definitions



Cluster is a set of independent computers combined into a unified system through systems software and networking technologies. In assigning systems to a cluster category, we use the following general rules:

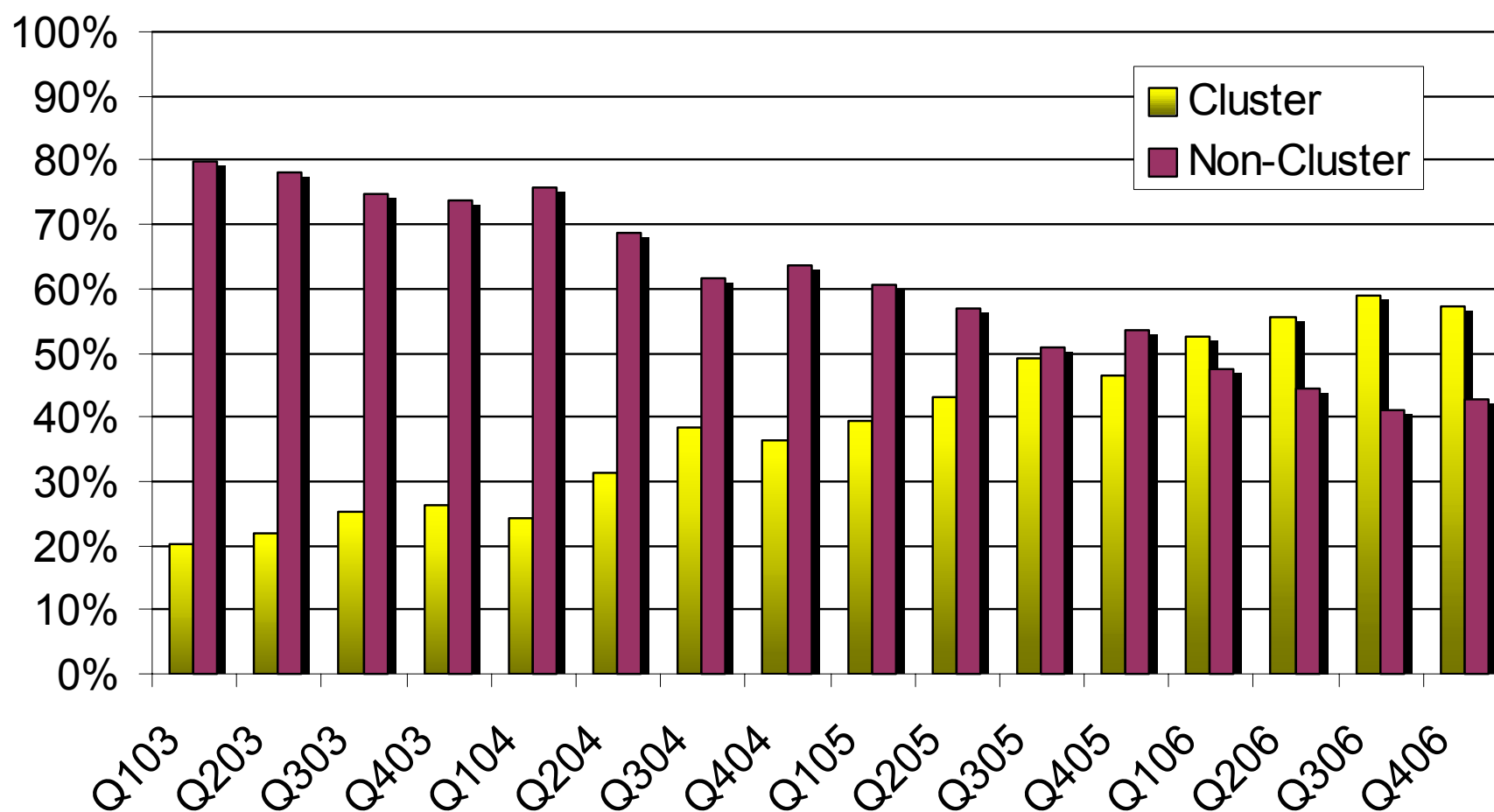
Component independence: clusters are composed from systems that could operate on their own outside of the cluster with a minimal additional hardware.

Standard interconnect technology: Cluster component are generally connected via an industry standard technology such as networking or I/O interfaces.

(An exception to this rule is the high end capability systems that may require specialized interconnect for specialty configurations).

Growth In Clusters

Cluster Market Penetration



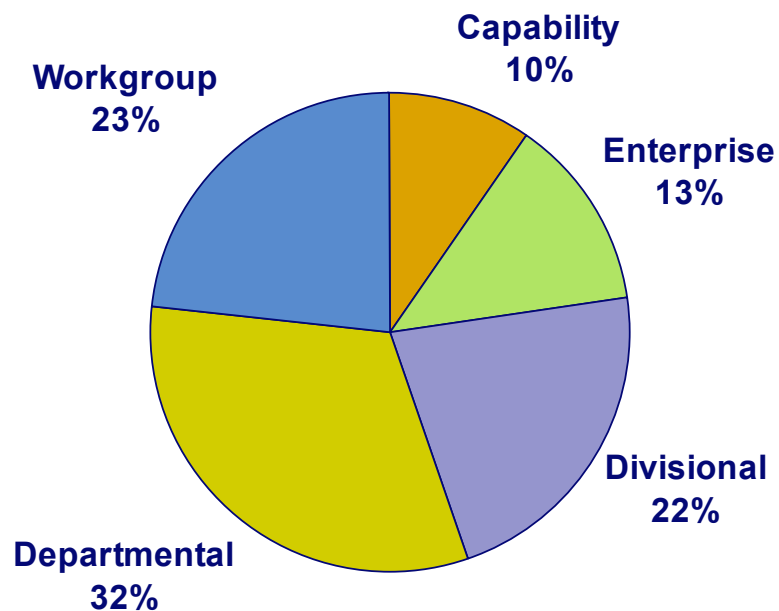
High Growth

Worldwide HPC Server and Cluster Revenue by Segment (\$M)						
	2002	2003	2004	2005	2006	2002–2006 CAGR
All HPC Servers	4,961	5,698	7,393	9,208	10,030	19.2%
Clusters	523	1,352	2,425	4,127	5,631	81.1%
Cluster Ratio	10.5%	23.7%	32.8%	44.8%	56.1%	
<i>Source: IDC, 2006</i>						

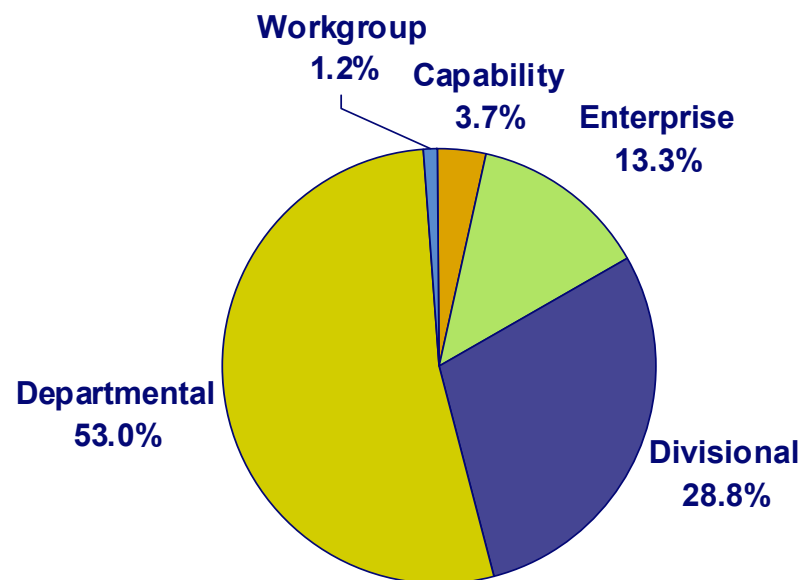
Clusters have averaged 81% yearly growth for four years!

Technical Total Market vs. Clusters by Competitive Segment, 2005 Revenue

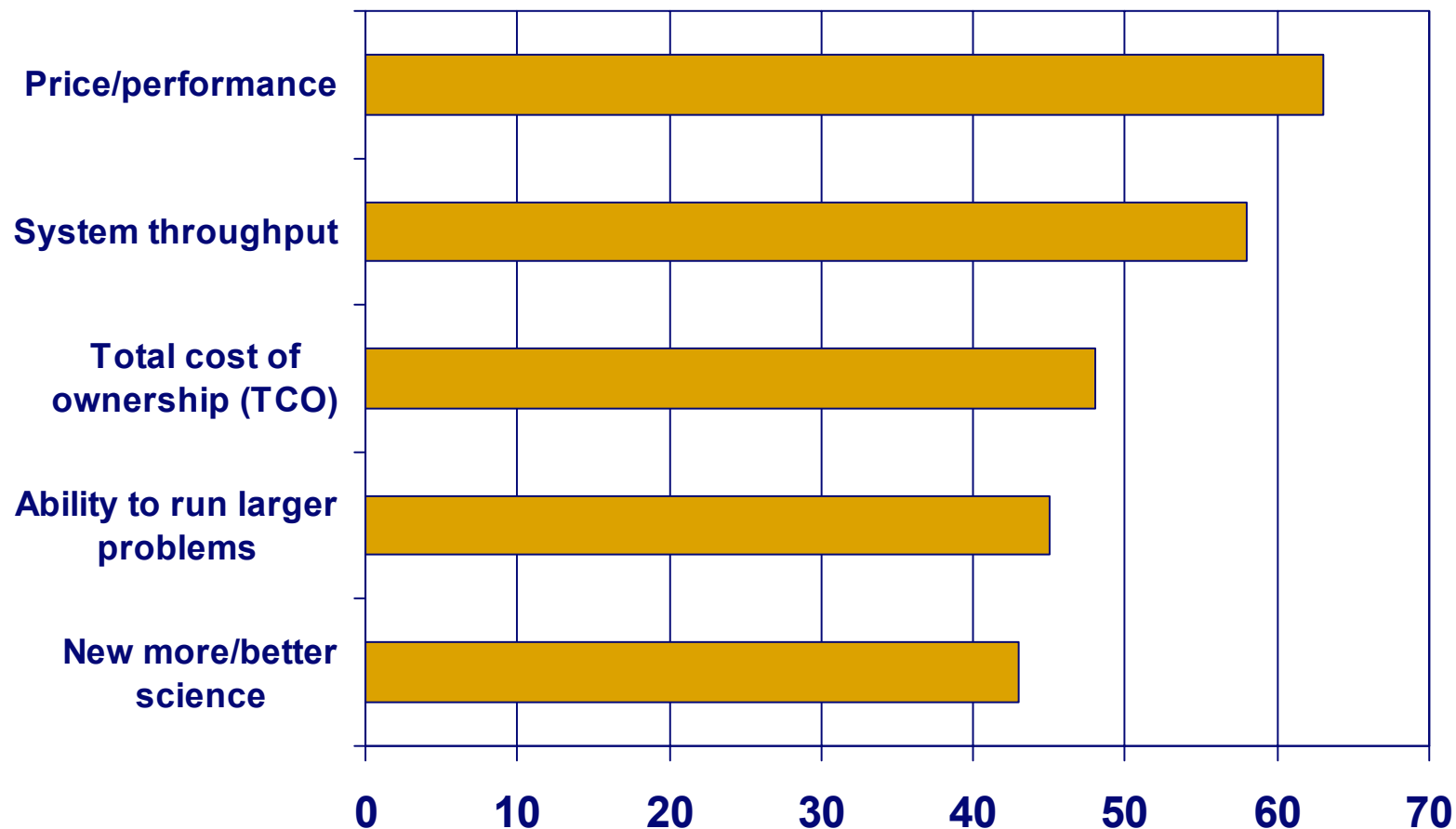
Total



Cluster



Top Three Reasons for Buying Clusters



...Customer Pain Points

Study Results: Top Challenges With Clusters Today



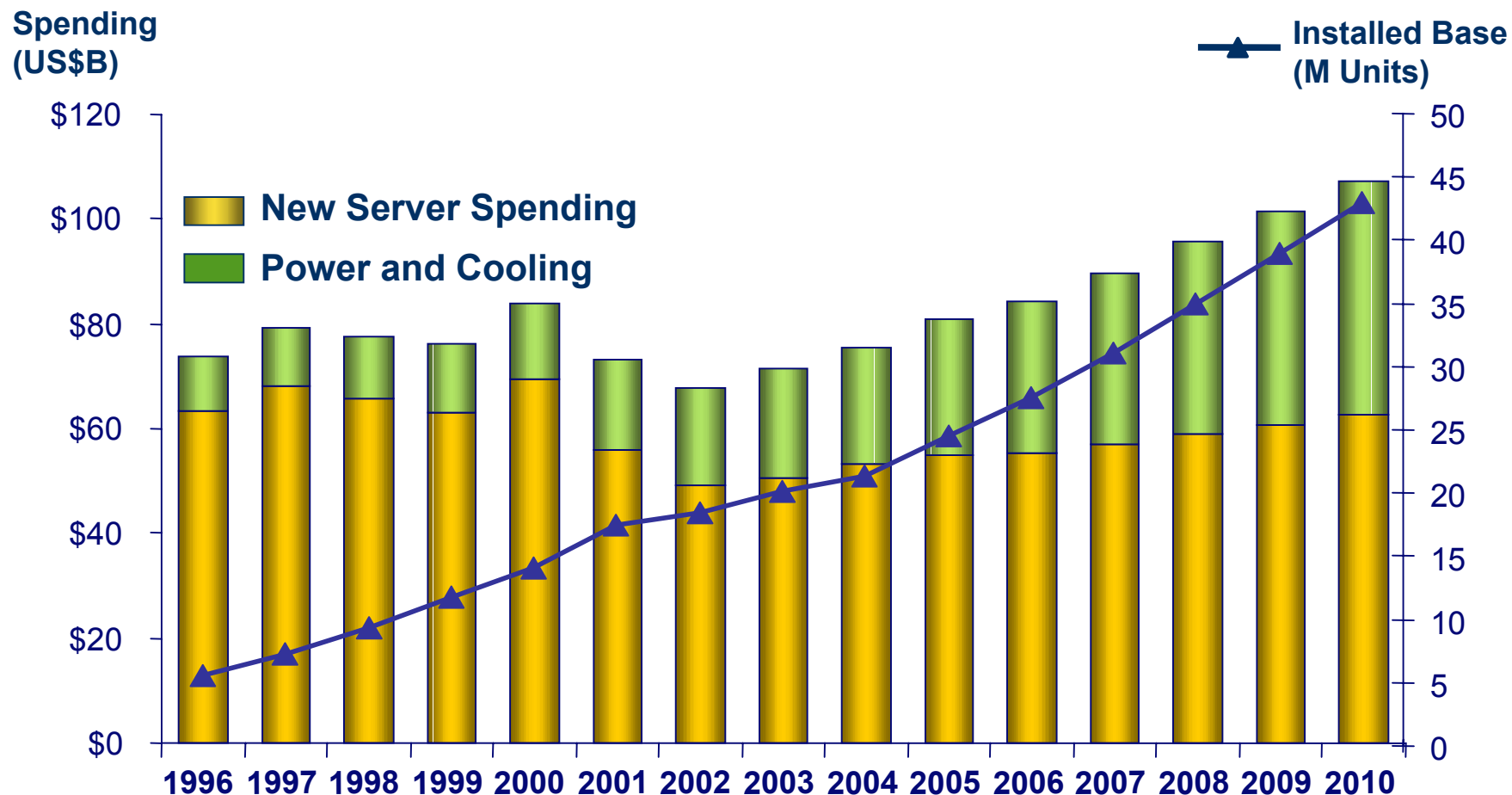
Facility issues in power, cooling and floor space have gone from being a minor nuisance four years ago, to the top concern for customers

- Part of the reason for this is that clusters provide a vastly larger number of processors for a given budget, but result in increased operation expense to power and cool the installed systems in the data center

The second major issue cited by customers is managing the cluster system

- The tools and system management features available have improved greatly, but not at the rate required by end users
- Some sites limit the maximum system size to under 128 processors due to the complexity of system management
- As a result, data center managers find themselves with many separate systems to manage and operate

Power and cooling spending



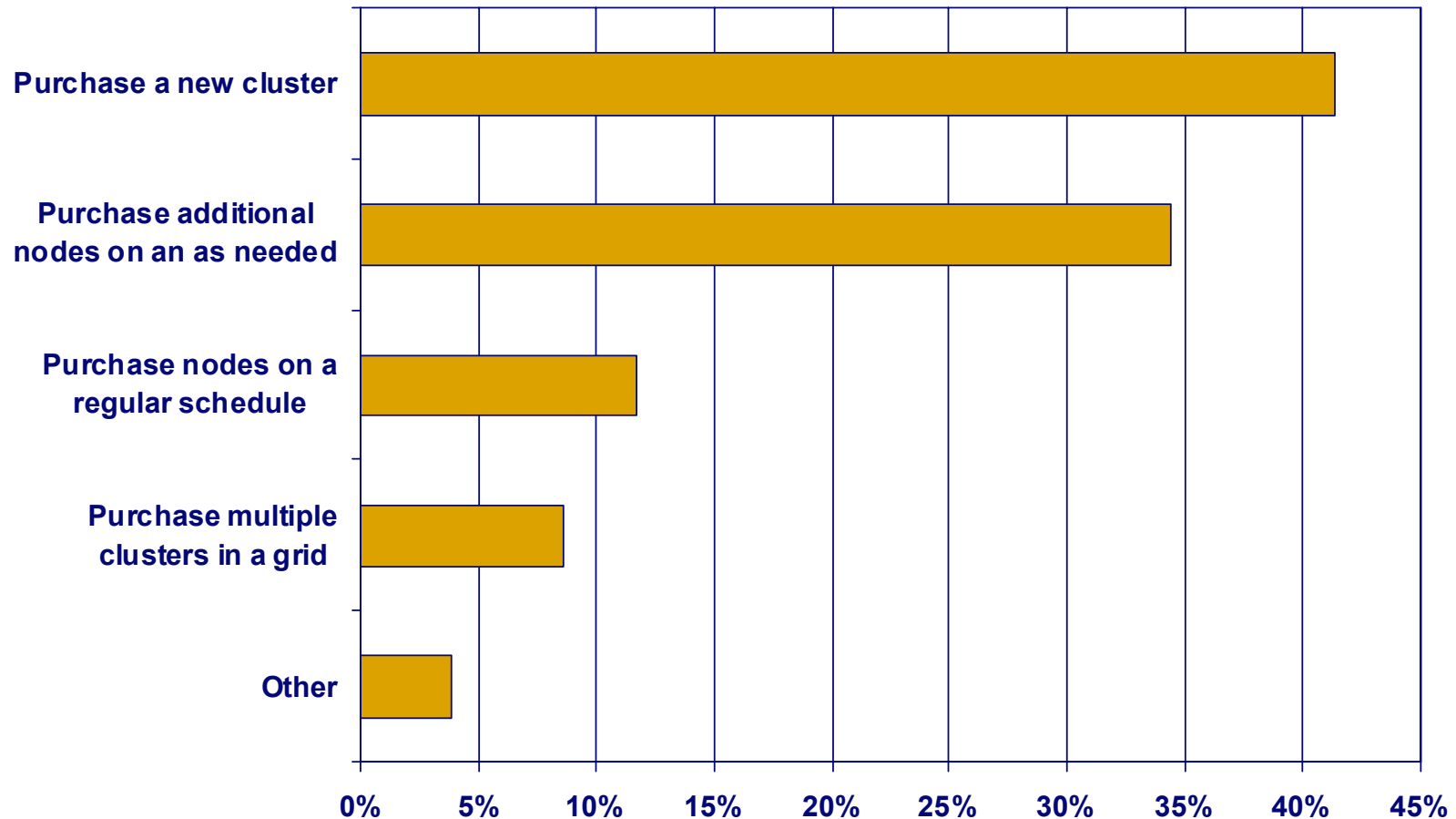
Study Results: Top Challenges With Clusters Today



The third major issue for end users regards the ability to scale user jobs or applications

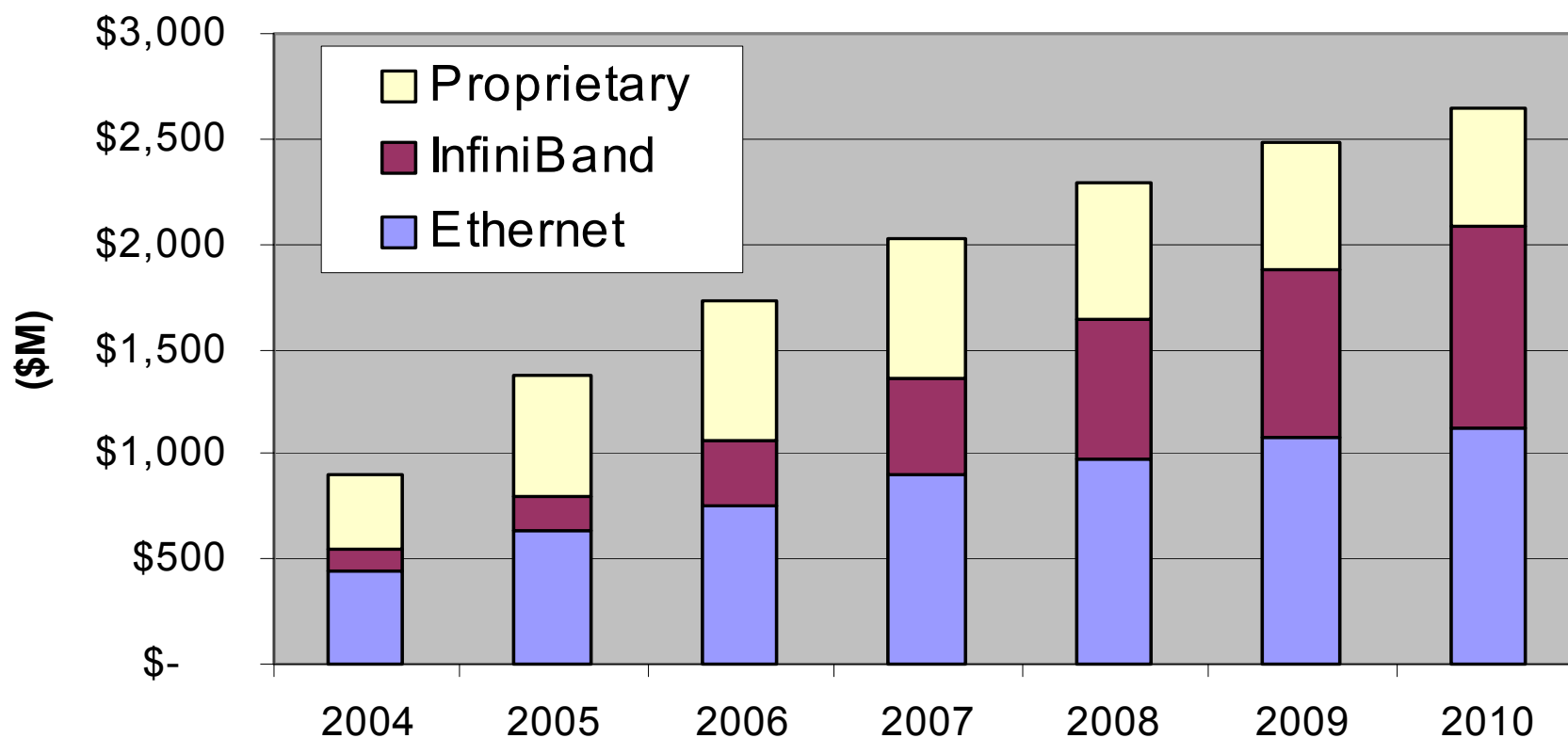
- More than half of all HPC user jobs today run on a single mode due to the complexity of scaling their applications and many still run on a single processor
- Interconnect performance limits the scaling of many user applications

Cluster Scaling Strategies



High-Performance Cluster Interconnect.

High-Performance Cluster Interconnect Value



- **InfiniBand CAGR: 47.1%**
- **InfiniBand over 1/3 of market value by 2010**

Study Results: Top Challenges With Clusters Today

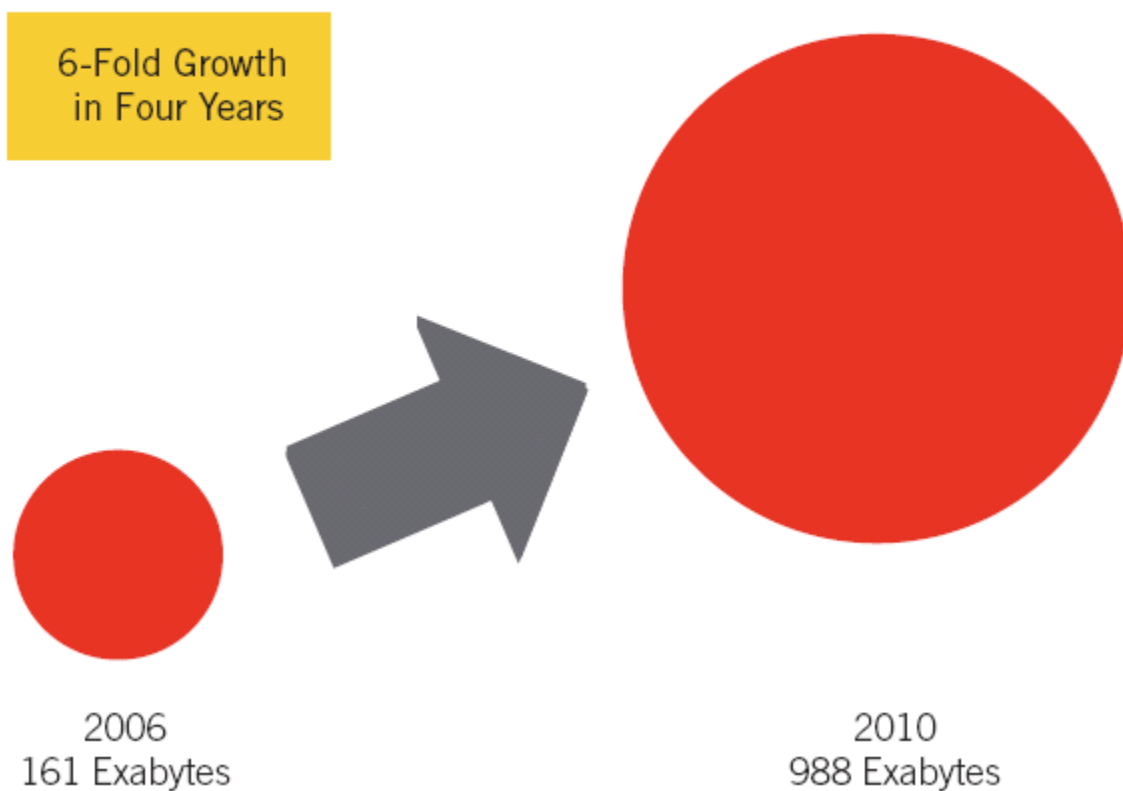


Storage and data management issues are both large and increasing in importance for customers

- Users are generating very large numbers of files and more users are using clusters and is causing most sites to have serious storage problems
- In addition, users want their immediately and without having to work to locate their files
- And in many industries, data retention requirements are growing which increases long term data storage requirements

Information explosion

Information Created, Captured and Replicated



Conclusions

Very strong overall growth

- Even stronger growth in clusters and blades
- And in the mid and low end of the market
- X86 and Linux are the current winners

Clusters are still hard to use

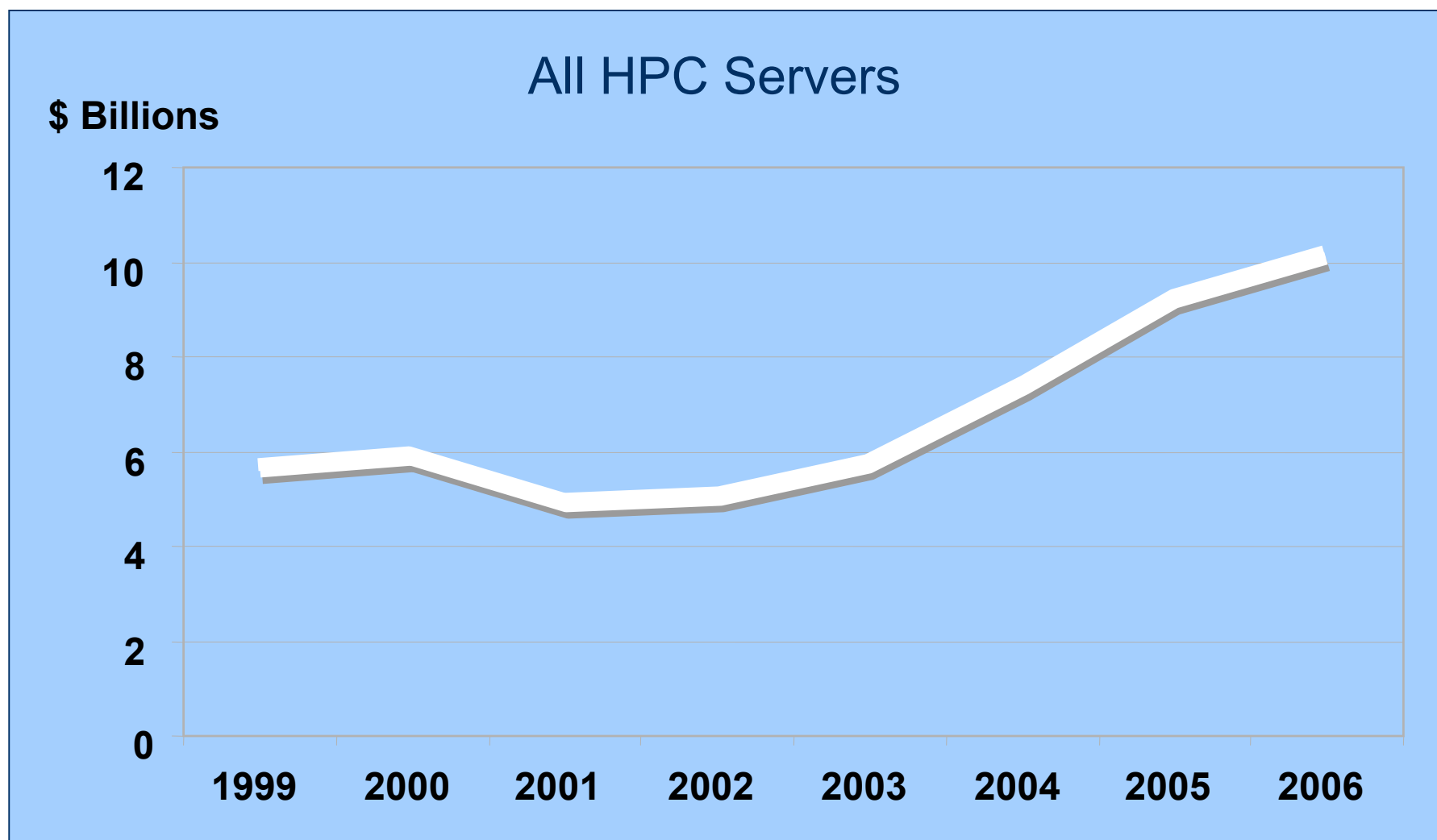
- And customers have a number of issues

The next revolution phase will be harder than the last one

- Driven by scalability issues
- Power, cooling and floor space will become limiters

Storage and data management are growing in importance

Strong Growth Since 2002



Questions?

Please email:
fmaldonado@idc.com

Or check out:
www.idc.com/hpc

